

pr light source

rev 0 1/10/01

TABLE "Spectral Foot"

Light Source Emiss Wave Wavelength Region Intensity

3M Deluxe Transparency Maker Light Source	400 - 1200	E, F, G, H, I, J, K	
558nm LED arrays	500 - 600	F, G	
569nm LED arrays	550 - 600	G	
590nm LED arrays	550 - 650	G, H	
602nm LED arrays	570 - 700	H	
615nm LED arrays	600 - 650	H	
637nm LED arrays	600 - 700	H, I	
644nm LED arrays	600 - 700	H, I	
Bluepoint	300 - 600, 940 - 1150	C, D, E, F, G	
Dental 3M-ESPE Elipar Trilight	400-500	D, E	
Dental 3M-ESPE Freelight LED	430-515	E	
Dental 3M LED Prototype	450-520	D, E, F	
Dental Akeda LUX-O-MAX LED	420 - 560	D, E, F	
Dental Apollo 95E Arc	440 - 520	E	
Dental Apollo E LED	420 - 550	E, F	
Dental Blue Light	400 - 500	D, E	
Dental LaserMed Accucure 3000 Laser	460 - 510	E	
Dental Yellow Light	370 - 800, 950 - 1100	E, F, G, H, I, J, K	
Flood Lamp	350 - 1200	D, E, F, G, H, I, J, K	
Fusion D Bulb	300 - 450, 500 - 600	B, C, D, F, G	
Fusion H Bulb	250 - 450, 550 - 600	A, B, C, D, G	
Fusion Q Bulb			
Fusion V Bulb	400 - 450, 550 - 600	D, G	
General Electric Blacklight (black)	350 - 400	C	
General Electric Blacklight (white)	350, 400, 435, 545	C	
General Electric Cool Light	400 - 700, > 960	F, G, H	
General Electric Daylight	390 - 700	D, E, F, G, H	
General Electric Germicidal	253	A	
Gro & Sho Plant Light	400 - 700	D, E, F, G, H, I	
Kodak Carousel 5200 Projector	450 - 700, 950 - 1100	E, F, G, H, I, J, K	
Kodak Carousel 5600 Projector	450 - 750, 950 - 1100	E, F, G, H, I, J, K	
Lesco Light (with new filter)	300 - 650	B, C, D, E, F, G, H	
Lesco Light (with old filter)	285 - 500, 570 - 600	B, C, D, E, G	
NIS Black Light Blue	300 - 400	B, C	
PDSC 2920 200W Hg Light	300 - 450, 550 - 600	B, C, D, G	
PDSC 930 200W Hg Light	300 - 600	B, C, D, E, F, G	
Philips 3000K Ultralume	400 - 650, 970 - 1000, 1080 - 1100	D, E, F, G, H, K	

Figure 1

Name	Solvent Used	Curing Mechanism	Abs. Wavelength (nm)	Wavelength Region	Lambda maExt. (nm)	Coef (W%)	Real Ext. (l/mo cm)
Initiator							
6 methyl 2,4 bistrichloro methyl s triazine	Acetonitrile	R	<350	A,B	272	13	
CD 1010 (triarylsulfonium SbF6)	Acetonitrile	C	<350	A,B	300	80	
CD1011 (triarylsulfonium PF6)	Acetonitrile	C	<350	A,B	300	100	
CD1012 (diaryliodonium SbF6)	Acetonitrile	C	<330	A	250	150	
CpFe (benzene) PF6	Acetonitrile	C	<350	A,B,C,D,E,F	240	258	
CpFe (durene) SbF6	Acetonitrile	C	<350	A,B,C,D,E	244	184	
CpFe (HEB) SbF6	Acetonitrile	C	<350	A,B,C,D,E,F	324	13	
CpFe (Mes) PF6	Acetonitrile	C	<350	A,B	244	231	
CpFe (Mes) SbF6	Acetonitrile	C	<350	A,B	244	188	
CpFe (Nap) SbF6	Acetonitrile	C	<400	A,B,C,D,E,F,G	220	400	
CpFe (pyrene) SbF6	Acetonitrile	C	<500	A,B,C,D,E,F,G	334	295	
CpFe (toluene) PF6	Acetonitrile	C	<350	A,B,C,D,E	242	257	
CpFeXyl CF3SO3	Acetonitrile	C	<350	A,B,C,D,E	242	278	
CpFeXyl PF6	Acetonitrile	C	<350	A,B,C,D	242	254	
CpFeXyl SbF6	Acetonitrile	C	<350	A,B,C,D	242	205	
Darocur 4265	Acetonitrile	R	<400	A,B,C	380	6	172
Irgacure 1300	Acetonitrile	R	<400	A,B,C	320	141	5021
Irgacure 1700	Acetonitrile	R	<430	A,B,C	390	1.3	34
Irgacure 184	Acetonitrile	R	<370	A,B	326	3.5	92
Irgacure 261	Acetonitrile	R	<500	A,B,C,D,E	388	2	106
Irgacure 2959	Acetonitrile	C	<300	A	272	481	13839
Irgacure 369	Acetonitrile	R	260 - 400	A,B,C	320	456	21538
Irgacure 651	Acetonitrile	R	312 - 394	A,B,C	342	8	257
Irgacure 784	Acetonitrile	R	<550	A,B,C,D,E	395	19	1300
Irgacure 819	Acetonitrile	R	<450	A,B,C,D	370	17	918
Irgacure 907	Acetonitrile	R	250 - 350	A,B	304	492	17635
KB1	Acetonitrile	R	312 - 394	A,B,C	342	8	257
KI 85 (Purified triarylsulfonium PF6)	Acetonitrile	C	<350	A,B	290	56	
Triphenylsulfonium SbF6	Acetonitrile	C	<350	A,B	300	183	
Tris (N-itoso-n-phenylthodroxylamine)	Acetonitrile	R	350 - 500	A,B,C,D,E	350	36	
XL 353 (triazine)	Acetonitrile	R	270 - 400	A,B,C	352	280	
Sensitizer							
4-Benzophenonethiol	Acetonitrile	R	<350	A,B	294	640	
4,5-Dibromofluorescein	Acetonitrile	C,R	500 - 550	E,F	540	131	8277
4,5,6,7-Tetrachlorofluorescein in DI water	DI water	R,C	400 - 540	D,E,F	500	328	15,415
52926-36A (Cyanine Dye)	Acetonitrile	R,C	450 - 600	F	554	2511	
53968-41 (Cyanine Dye)	Acetonitrile	R,C	500 - 700	F,G,H,I	650	3772	
53968-42 (Quinoline Dye)	Acetonitrile	R,C	500 - 750	G,H,I,J,K	604,704	417,382	
9 - Fluorenone	Acetonitrile	C,R	<320	B,C	296	266	
Acridine Orange, hydrochloride hydrate	Acetonitrile	C,R	400 - 550	D,E	494	1439	55698
Acriflavine hydrochloride	Acetonitrile	C,R	400 - 500	D,E	458	615	
Azure A	Acetonitrile	C,R	500 - 700	G,H,I	630	1346	50380
Azure B	DI water	R,C	450 - 700	G,H,I	600,650	1200	36500
Azure C	Acetonitrile	C,R	500 - 650	G,H	608	748	26949

Curing Resource Center

*Integrated Solutions to
Customer's Curing Needs*

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Interactive Photo Curing System

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Views By Name

Substrates

Substrates
(by Color)Light
SourcesPhoto
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UV Stabilizers

Wavelength Region Views

Combined

Substrates

Light
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Initiators

UV Stabilizers

UV Stabilizer

Collapse

Expand

Name	Solvent Used	Abs. Wavelength (nm)	Wavelength Region	lambda max (nm)	Ext. Coef (W%)	Real Ext (U/mol cm)
Cyasorb UV9	Acetonitrile	<380	A,B,C	288		495
Cytec 1164	Acetonitrile	<380	A,B,C	292		584
Cytec 3381	Acetonitrile	<260	A	204		227
Cytec 3604	Acetonitrile	<270	A	204		220
Norbloc 7966	Acetonitrile	<380	A,B,C	336		470
Tinuvin 1130	Acetonitrile	<400	A,B,C	340		190
Tinuvin 144	Acetonitrile	<300	A	276		16.7
Tinuvin 292	Acetonitrile	<270	A	208		36
Tinuvin 384	Acetonitrile	<400	A,B,C	340		253
Tinuvin 770DE	Acetonitrile	<260	A	208		43
Tinuvin 900	Acetonitrile	<400	A,B,C	342		272
Tinuvin P	Acetonitrile	380	A,B,C	340		517
UV-24	Acetonitrile	<400	A,B,C	286		350
Uvinul 4050H	Acetonitrile	<260	A	206		280

Next

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Select Next or Previous to view additional Substrates, Photoinitiators or Light Sources.

Figure 2A

Figure 3

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Substrate Tested	Color of Substrate	Thickness	Transmission WaveWavelength Region (nm)
3M Microflex 8025-1115 80-6104-6609-8	orange,Cu traces	2-2.8 mil	> 465 F,G,H,I,J,K
ABS (Sample 1)	cream,opaque	0.13	> 400 E,F,G,H,I,J,K
ABS (sample 2)	cream,opaque	0.122	> 400 F,G,H,I,J,K
Acrylic	colorless,clear	0.111	> 370 D,E,F,G,H,I,J,K
Al CD disk (40nm)	reflected mirror	40 nm	> 300 B,C,D,E,F,G,H,I,J,K
Al CD disk (45nm)	reflected mirror	45 nm	> 300 B,C,D,E,F,G,H,I,J,K
Al CD disk (50nm)	reflected mirror	50 nm	> 300 B,C,D,E,F,G,H,I,J,K
Al on BET	reflected mirror	3 mil	> 320 B,C,D,E,F,G,H,I,J,K
Alumina	opaque white	0.034	> 330 C,D,E,F,G,H,I,J,K
BT Epoxy	opaque brown	0.063	> 520 G,H,I,J,K
Canvas	natural	32 mil	> 400 D,E,F,G,H,I,J,K
Diamond Grade Sheeting	reflected mirror	22 mil	> 400 D,E,F,G,H,I,J,K
FR4 with green solder mask	green	0.062	> 400 E,F,I,J,K
GFRP precision punch	light yellowish-green,translucent	0.135	> 360 D,E,F,G,H,I,J,K
GFRP (FR4)	light yellowish-green,translucent	0.067	> 360 D,E,F,G,H,I,J,K
Glass slide	clear,colorless	0.222	> 310 C,D,E,F,G,H,I,J,K
Halar ethylene-chlorotrifluoroethylene ECTFE film	hazy colorless (off-white)	19 mil	230 - 275,> 280 A,B,C,D,E,F,G,H,I,J,K
HDPE	white	0.127	> 280 B,C,D,E,F,G,H,I,J,K
Kapton	orange,transparent	0.6 mil	> 435 E,F,G,H,I,J,K
Kynar polyvinylidene fluoride PVDF film	hazy colorless	15 mil	> 200 A,B,C,D,E,F,G,H,I,J,K
Mirror Multi-layer film	reflected mirror	2 mil	> 200 A,B,C,D,K
Multi-layer film	multi color	2 mil	>200 B,C,D,E,H,I,J,K
One layer Security System card	opaque white	21 mil	> 400 D,E,F,G,H,I,J,K
PC	opaque white	15 mil	415 - 530 ,> 600 E,H,I,J,K
PC Hyzod FD-9200	colorless,clear	0.116	> 280 C,D,E,F,G,H,I,J,K
PC Lexan 9034	colorless,clear	0.119	> 390 D,E,F,G,H,I,J,K
PCB w/ green solder mask (spl 1)	green,no traces,board only	0.033	400 - 600 ,> 660 E,F,I,J,K
PCB w/ green solder mask (spl 2)	green	0.066	400 - 610,>660 E,F,I,J,K
PCB w/ green solder mask (spl 3)	green	0.066	400 - 600 ,> 660 E,F,J,K
PCB w/ green solder mask (spl 4)	green,ground plane stripes 1/4" across	0.066	400 - 600 ,> 660 E,F,G,J,K
PCB w/ green solder mask (spl 5)	green (yellowish tone)	0.063	> 450 E,F,G,J,K
PCB w/ green solder mask (spl 6)	green (bluish tone)	0.068	400 - 600 ,> 670 E,F,J,K
PETG	opaque white	22 mil	> 400 D,E,F,G,H,I,J,K
Polyimide	opaque dark brown	0.074	> 520 G,H,I,J,K
Polypropylene	translucent white	0.128	> 280 C,D,E,F,G,H,I,J,K
Teflon	opaque white	0.161	> 200 A,B,C,D,E,F,G,H,I,J,K
TPX polymethylpentene PMP film	hazy colorless	11 mil	230 - 275 ,> 280 A,B,C,D,E,F,G,H,I,J,K
Two layer Security System Card	opaque white	13 mil	> 420 D,E,F,G,H,I,J,K
Udel polysulfone Thermalux film	hazy colorless (off-white)	10 mil	> 310 C,D,E,F,G,H,I,J,K
UHMWPE	sl translucent white	0.14	> 280 C,D,E,F,G,H,I,J,K
Ultem 1000 polyetherimide sample 1	amber,transparent	0.13	> 415 E,F,G,H,I,J,K
Ultem 1000 polyetherimide sample 2	amber,transparent	0.122	> 430 E,F,G,H,I,J,K
Ultem Tempalux Film	amber,transparent	8 mil	> 400 D,E,F,G,H,I,J,K
Ultem (filled) Mint-Pac by Circuit Wise	amber,translucent	0.064	> 410 F,G,H,I,J,K
Ultrason E polyethersulfone PES film	hazy amber	10 mil	> 300 C,D,E,F,G,H,I,J,K
UVPS	orange,transparent	3 mil	310 - 400,> 470 F,G,H,I,J,K
Victrex PEEK Film polyetheretherketone	amber,hazy transparent	10 mil	> 390 D,E,F,G,H,I,J,K
Vinyl card	opaque white	30 mil	> 410 D,E,F,G,H,I,J,K
Vinyl film	clear	7.5 mil	> 380 D,E,F,G,H,I,J,K

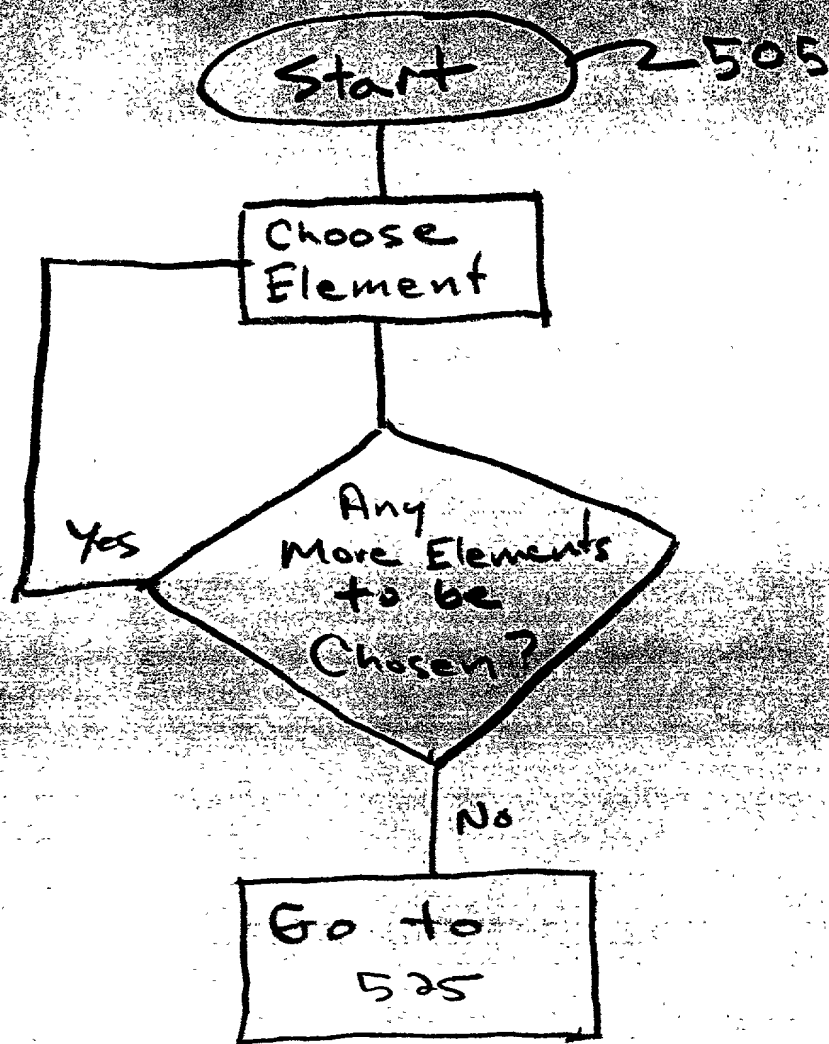


Figure 4A

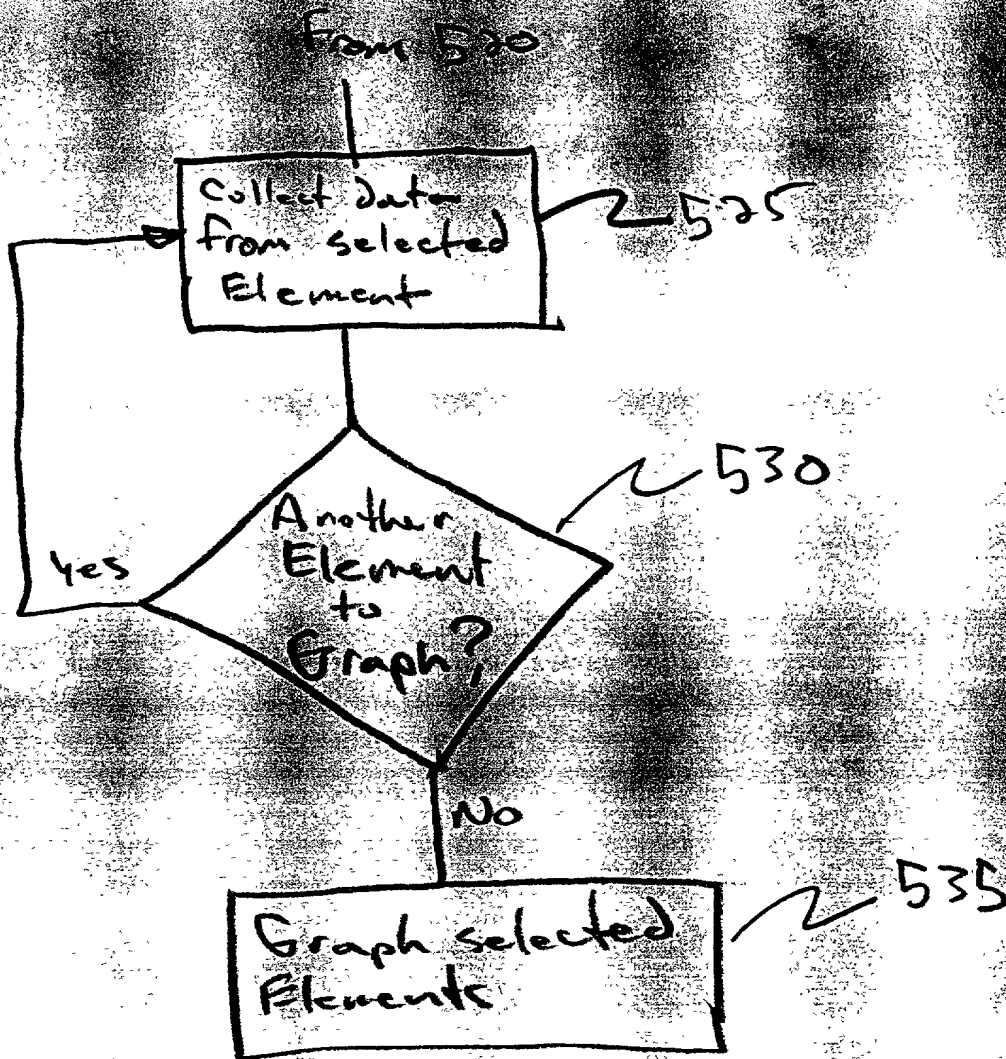


Figure 4B

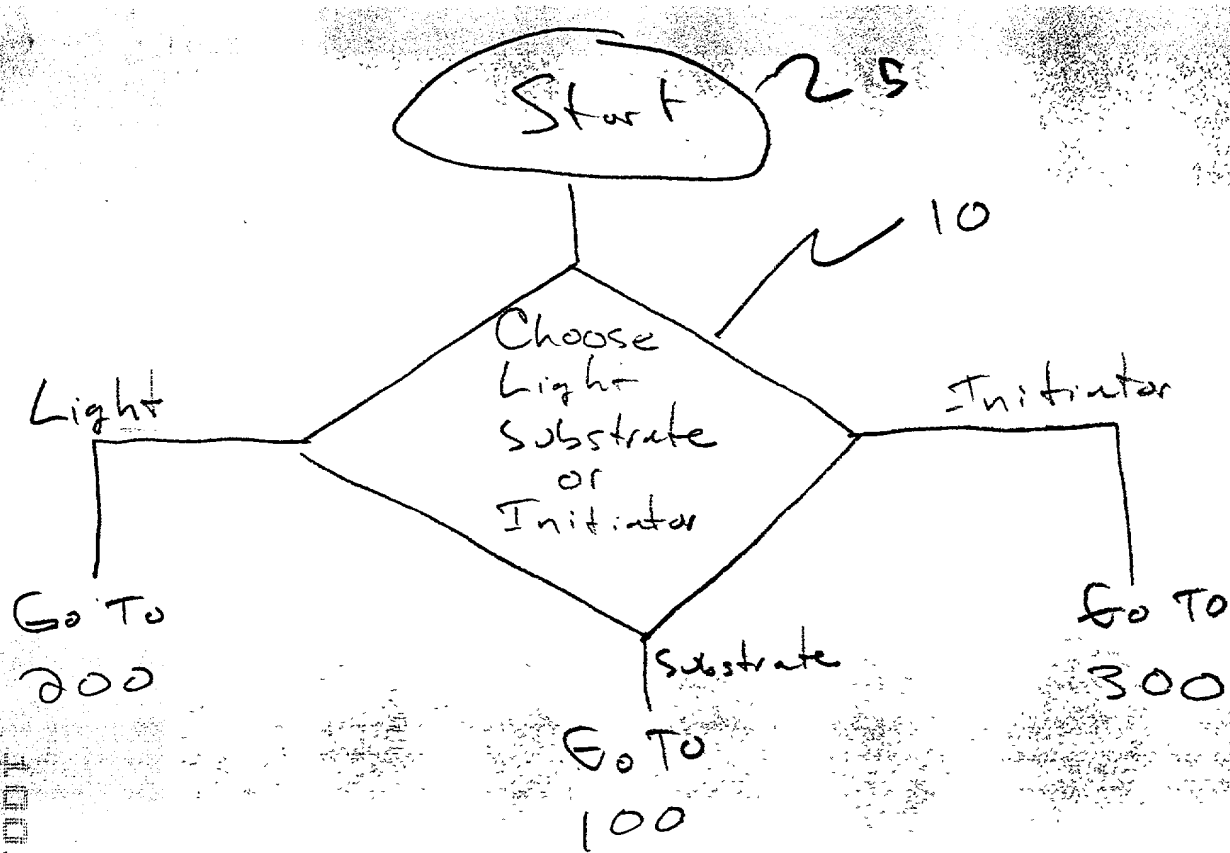
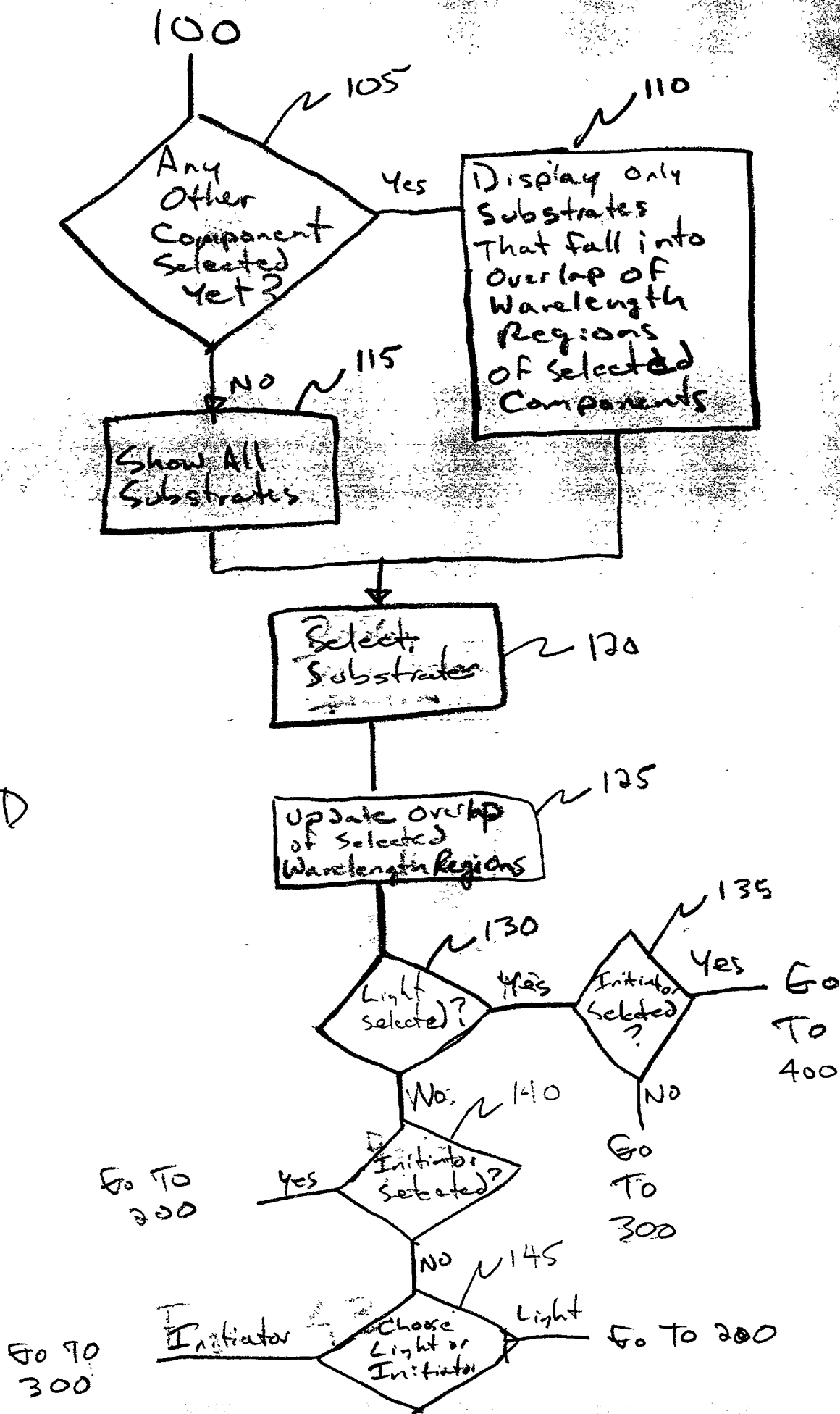


Figure 4K

Figure 4D



10044360 102201

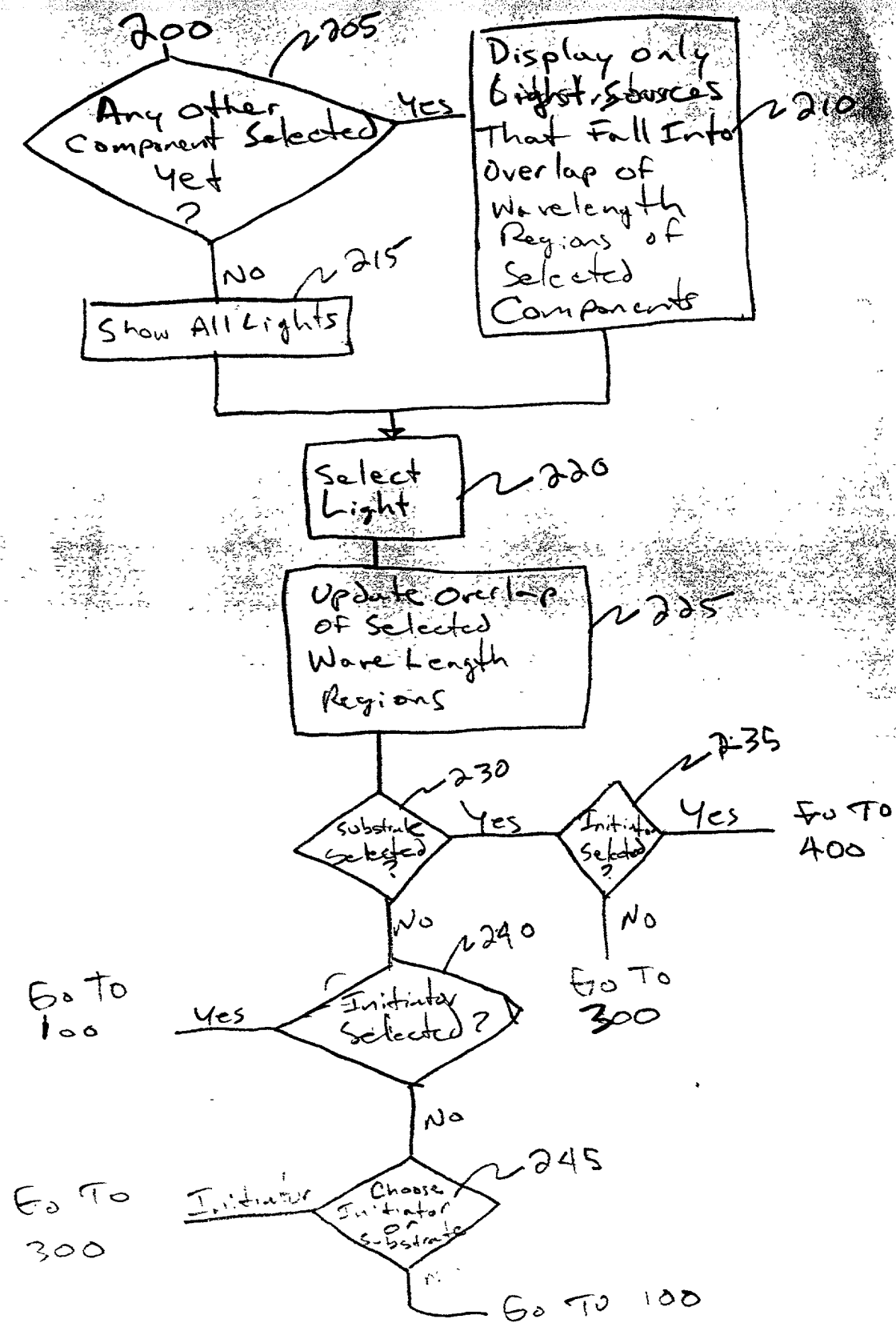


Figure 4E

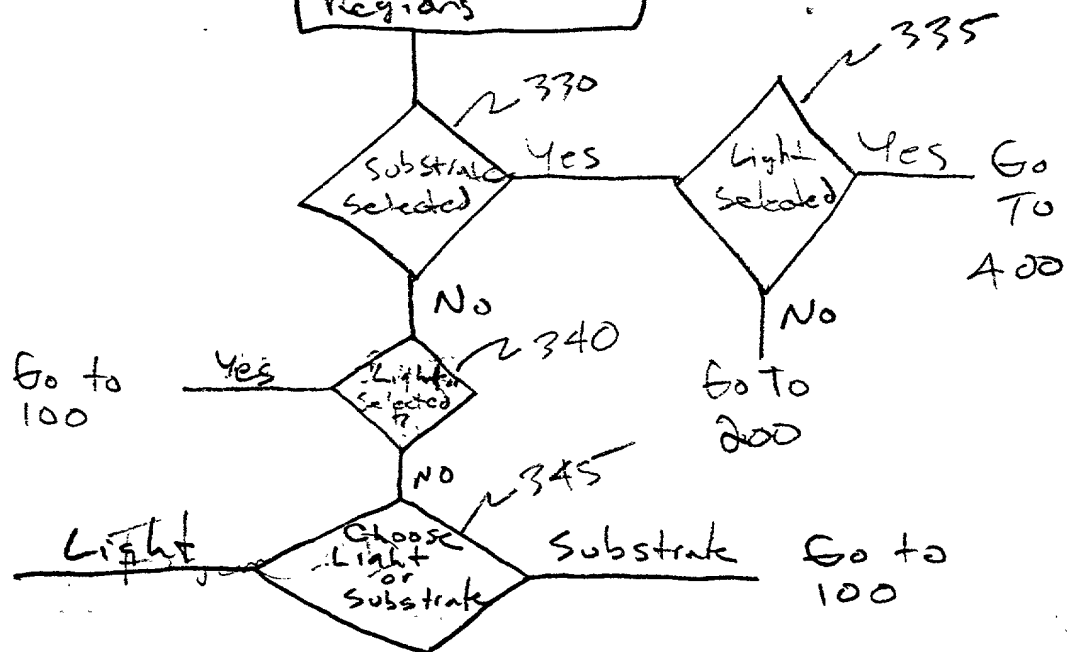
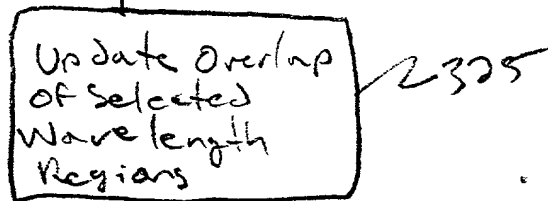
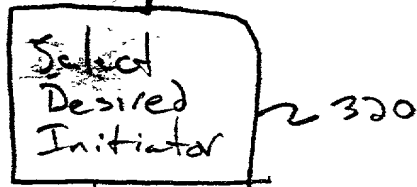
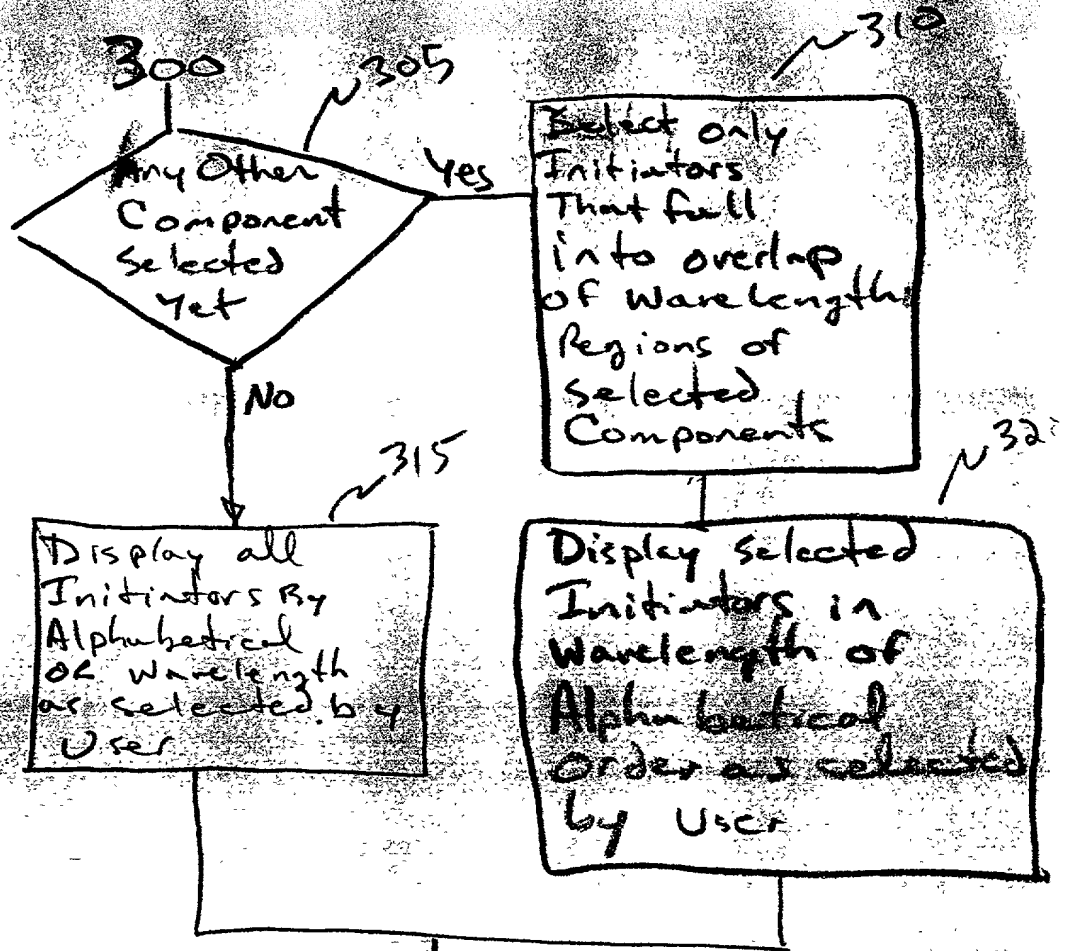


Figure 4B

10014390 102201

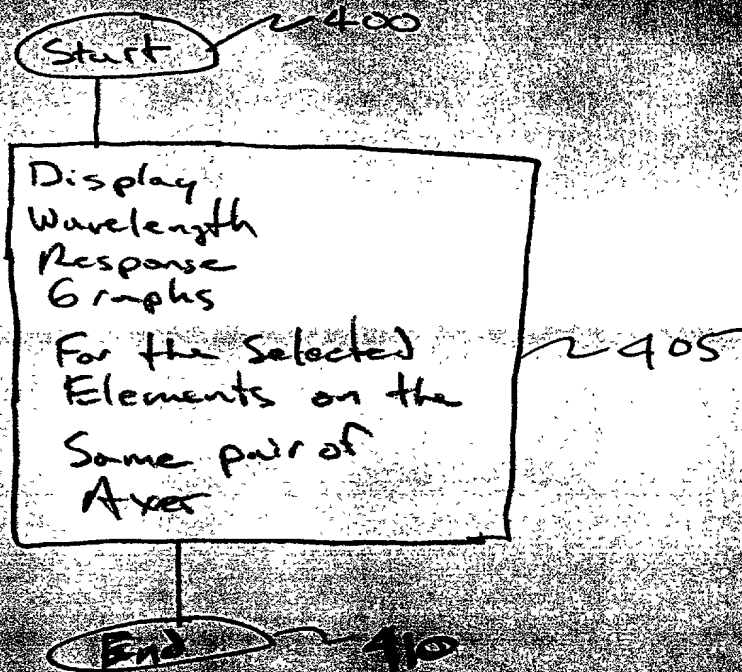


Figure 4

Rec'd 9/18/01

Figure

5 A

Light Source Profile

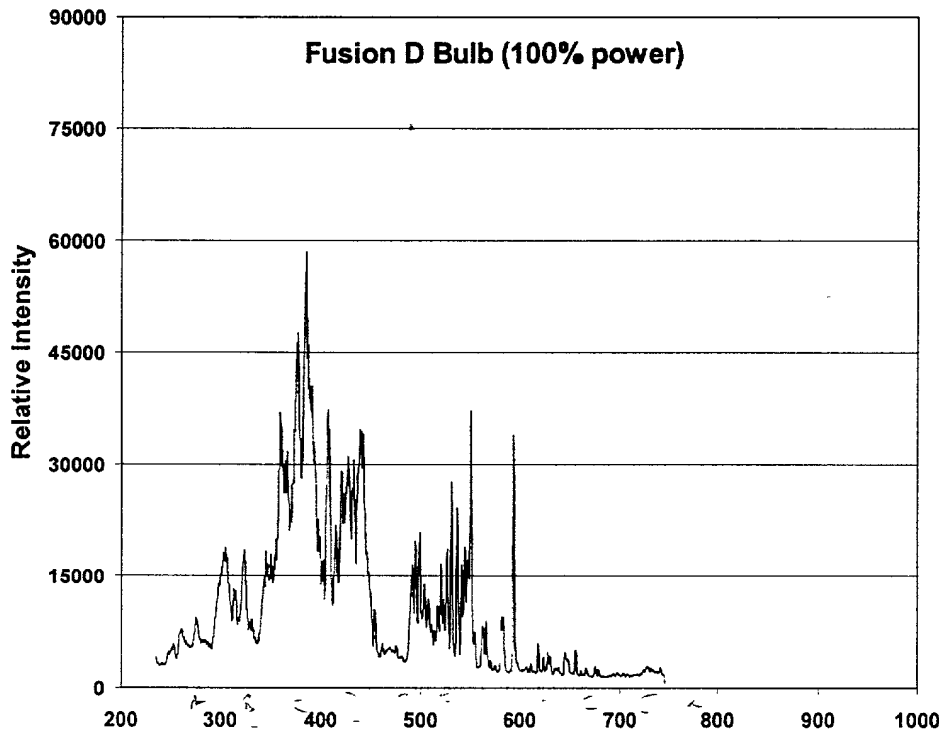
Light Sources: Fusion D Bulb
Emiss. Wavelength 300 - 450, 500 - 600
(nm)
Wavelength B, C, D, F, G
Region:
Intensity:
Notes:

Picture of Light Source:



Fusion D 100.xls

Emiss Spectrum:



Emiss Data (Enter data from frequencies 200 - 1000 only. Enter data separated by a comma and one space (i.e. 12.3, 32.1):

4371, 3681, 4423, 4041, 4026, 4369, 4010, 4228, 3519, 4111, 3627, 4240, 3962, 3797, 3989,
4447, 3831, 3689, 3860, 3839, 4266, 3601, 3955, 4401, 3722, 3732, 3956, 4012, 3506, 3899,
4133, 4359, 4452, 3584, 4151, 3963, 3765, 3692, 3927, 4447, 3759, 3826, 4215, 3946, 3853,
4117, 4283, 3644, 3793, 3609, 3810, 4253, 3981, 4295, 3881, 3604, 3679, 3791, 3519, 3888,
4435, 3511, 4463, 3632, 4161, 3553, 4280, 3803, 3590, 3769, 4096, 4095, 3157, 3210, 3202,
3285, 3130, 3130, 2986, 3018, 3082, 3306, 3263, 3302, 3106, 3109, 3042, 3115, 3082, 3266,
3263, 3530, 3749, 4239, 4413, 4841, 4757, 4922, 4423, 4687, 4975, 5386, 5045, 5378, 5474,
5935, 5550, 5610, 4778, 4176, 3786, 3906, 3883, 4203, 4462, 5436, 6021, 7066, 7135, 7701,
7402, 7829, 7338, 7530, 6794, 6843, 6405, 6634, 6042, 6018, 5783, 6329, 5930, 5807, 5502,
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5456, 5218, 5120, 5882, 6010, 6826, 6847, 7690, 8224, 9277, 9379, 10762, 10314, 11424, 12000,
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1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

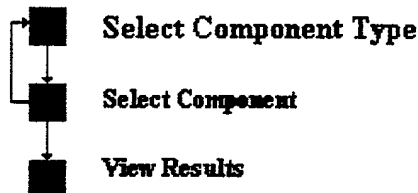
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2154, 2026, 1890, 1834, 1823, 1754, 1706, 1616, 1691, 1773, 1794, 1821, 1994, 2069, 1973,
1751, 1672, 1599, 1722, 1898, 1936, 1825, 1834, 1759, 1685, 1599, 1642, 1662, 1781, 1823,
1768, 1706, 1824, 1856, 1909, 1882, 1826, 1813, 1839, 1820, 1914, 1985, 1909, 1751, 1678,
1674, 1882, 2042, 2069, 1962, 2042, 2298, 2423, 2538, 2424, 2256, 2199, 2421, 2698, 2901,
2794, 2691, 2722, 2922, 2565, 2261, 2239, 2559, 2672, 2751, 2626, 2389, 2250, 2394, 2453,
2365, 2152, 2026, 2143, 2330, 2282, 2175, 2069, 2000, 2104, 2421, 2735, 2880, 2708, 2536,
2209, 2042, 1985, 1884, 1818, 1738, 1661, 618

Maximum Frequency (Enter 1000 or smaller if the frequency range is less than 1000):

746

102207 0547001

Select a Substrate, Light Source, and/or Photo Initiator Type



This process allows you to select up to three components to view together. For each component, you must first select a component type. There are three types of components to select from (Substrate, Photo Initiator, or Light Source). After selecting the desired component type, you can then select a component of that type.

- Select the first component type from the drop-down list below and click the Next > button.

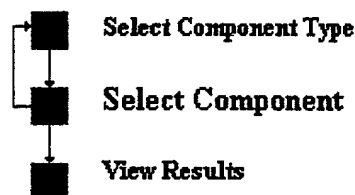
Select the first component type:

Substrate

Next >

Figure 6A

Select a Substrate, Light Source, and/or Photo Initiator



- If you want to view more components, select a component of the selected type from the drop-down list below and click the Next > button.

- If you want to view the current component(s), select a component of the selected type from the drop-down list below and click the Finish button.

- If you want to select a different component type, click the < Back button.

Select a Substrate:

BT Epox

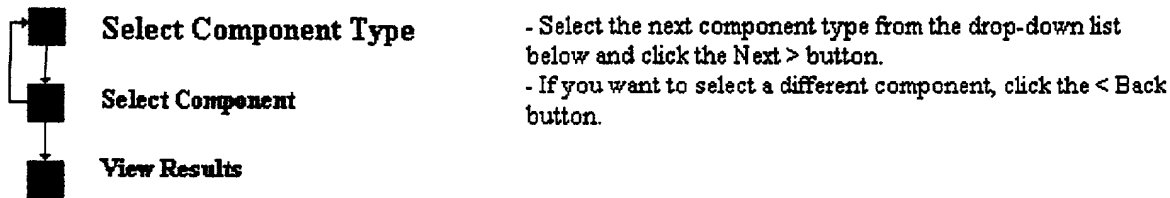
< Back

Next >

View Overlay

Figure 6B

Select a Substrate, Light Source, and/or Photo Initiator Type

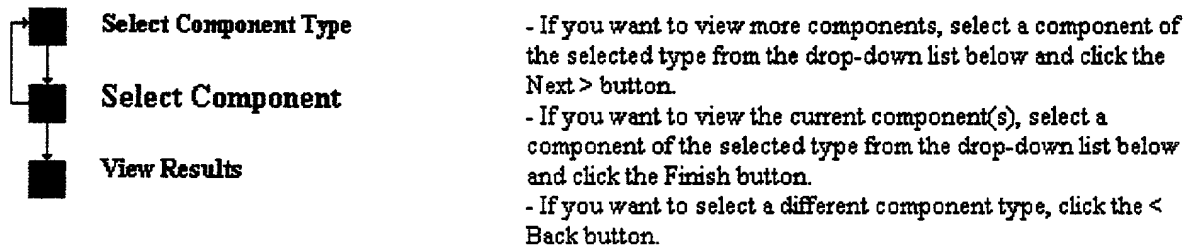


Select the second component type:

Component Type #1	Substrate
Component #1	RT Epoxy

Figure 6C

Select a Substrate, Light Source, and/or Photo Initiator



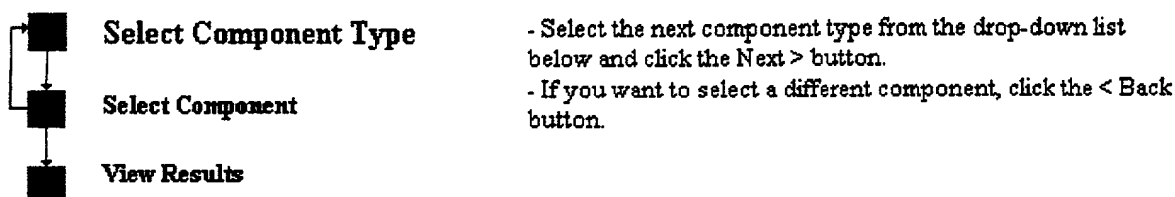
Select a Photo Initiator:

Component Type #1	Substrate
Component #1	RT Epoxy

Figure 6D

10044390 102201 06E4T001

Select a Substrate, Light Source, and/or Photo Initiator Type



Select the third component type:

Light Source

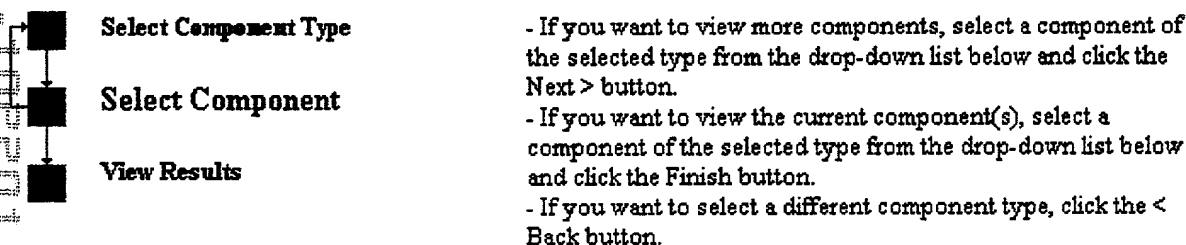
Component Type #1:	Substrate
Component #1:	BT Epoxy
Component Type #2:	Photo Initiator
Component #2:	Disperso Blue I

< Back Next >

Figure 6E

Select a Substrate, Light Source, and/or Photo Initiator

10014350 "10014350"



Select a Light Source:

Eluagont

Component Type #1:	Substrate
Component #1:	BT Epoxy
Component Type #2:	Photo Initiator
Component #2:	Disperso Blue I

< Back View Overlay

Figure 6F

SRC Curing Resource Center - Microsoft IE5.0/3M

File Edit View Favorites Tools Help Address

Back Forward Stop Search Favorites History

Curing Resource Center

Integrated Solutions to
Customer's Curing Needs

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Overlay Diagram

* To print, click on this frame first, then select "Print" from the "File" menu above. For best print results, use Internet Explorer.

The purpose of this overlay is to compare spectra and therefore the spectra have been scaled to achieve this. The transmittance of all substrates is scaled from 0-100%. In certain cases, the transmittance may appear to be nearly zero but may not actually be zero. In such cases, it may be possible to select an appropriate light source to allow the transmittance of light. The absorbance spectra of photoinitiators/sensitizers have been scaled between 0-100 to allow comparison between the transmittance spectra of the substrate and the absorbance spectra of the photoinitiators/sensitizers. The spectra of the light sources are also scaled from 0-100.

NOTE: Source spectra is uncorrected. Please contact someone from the Curing Resource Center ("Contacts" to the left) if you need further information

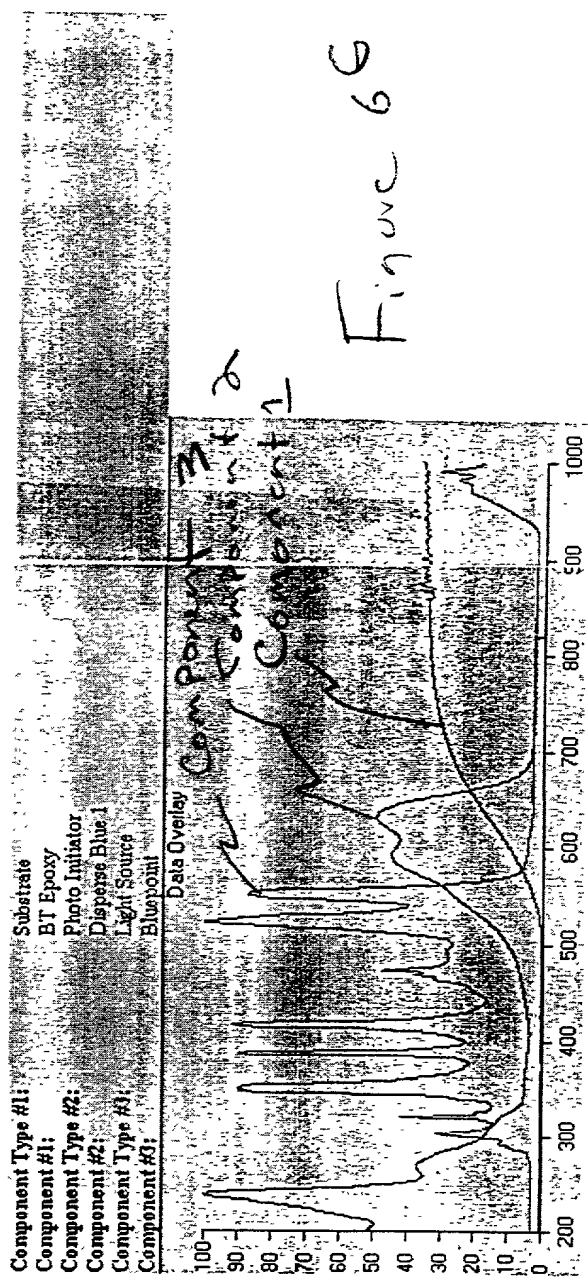


Figure 66

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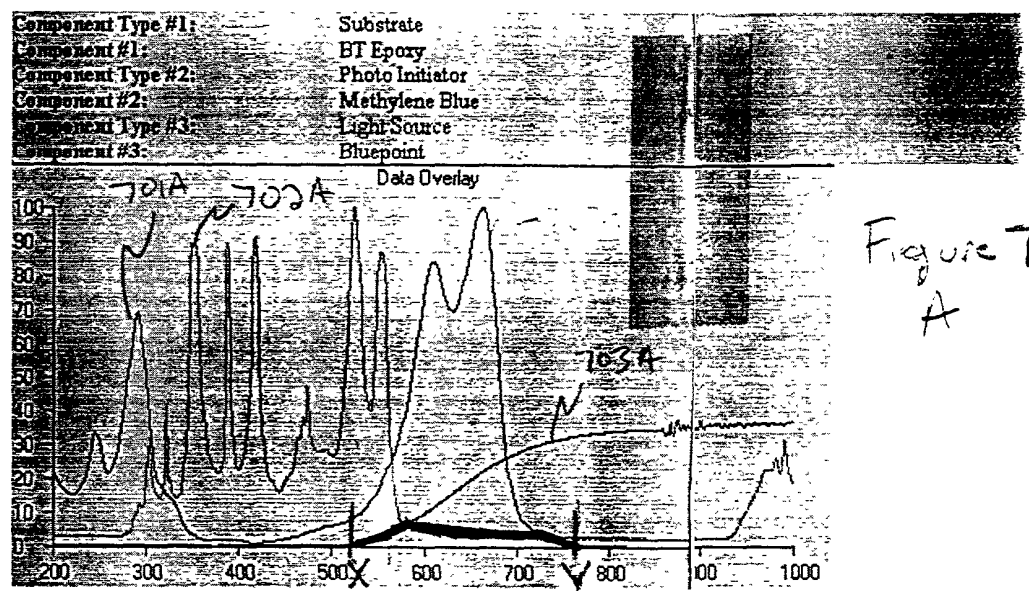
UV Stabilizers

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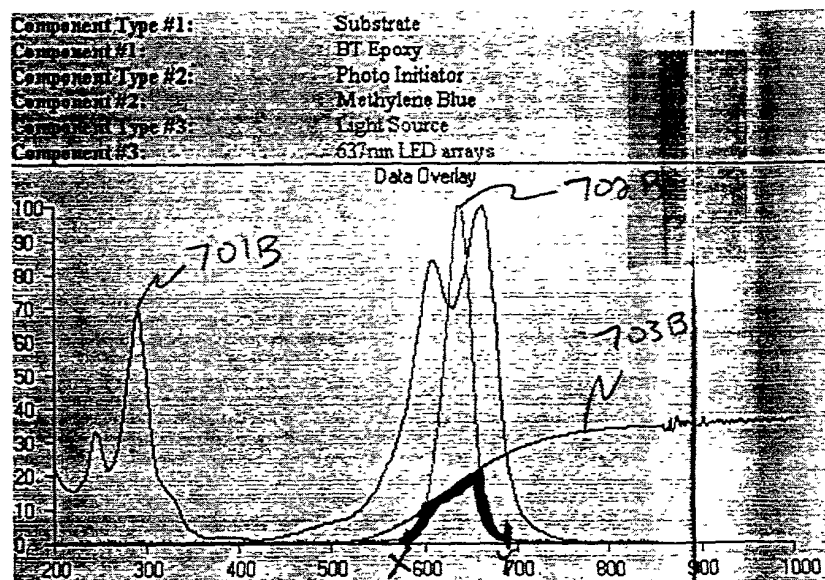
Photo Initiators UV Stabilizers

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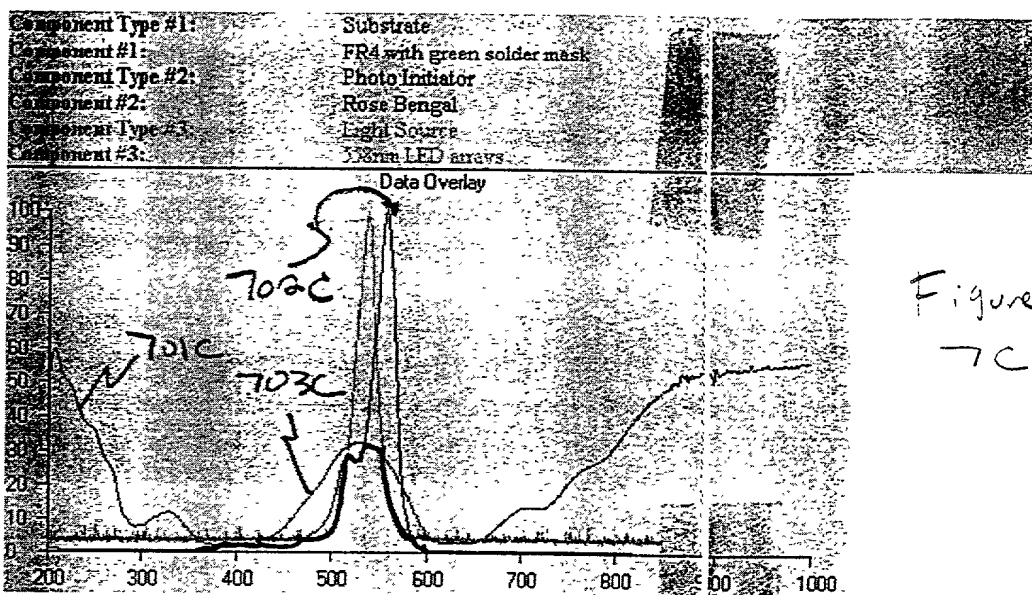
Photo Initiators UV Stabilizers

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Done


Start SRC Curing Resource C... untitled - Paint

SRC Curing Resource Center - Microsoft IE5.0/3M

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Select a Substrate, Light Source, and/or Photo Init.

**Select Component Type**

**Select Component**

**View Results**


- If you want to view more components, select a component selected type from the drop-down list below and click the N-

- If you want to view the current component(s), select a com. the selected type from the drop-down list below and click the button.

- If you want to select a different component type, click the button.

Select a Light Source:

Component Type #1	Light Source
Component #1	Dental Hardener
Component Type #2	Light Source
Component #2	Custom D Bulb

**< Back**


**View Overlay**

Figure
7D

Done

Start

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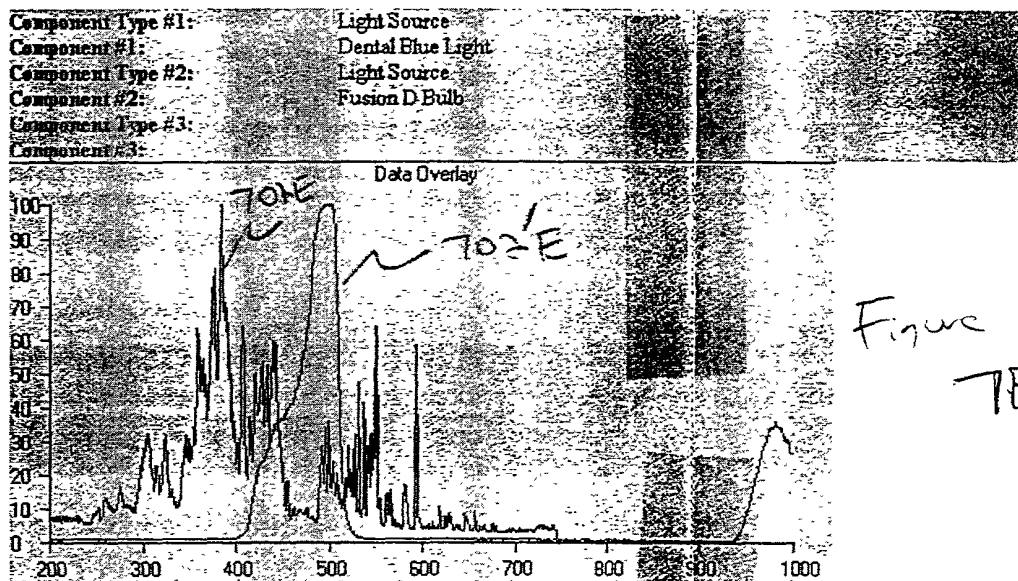
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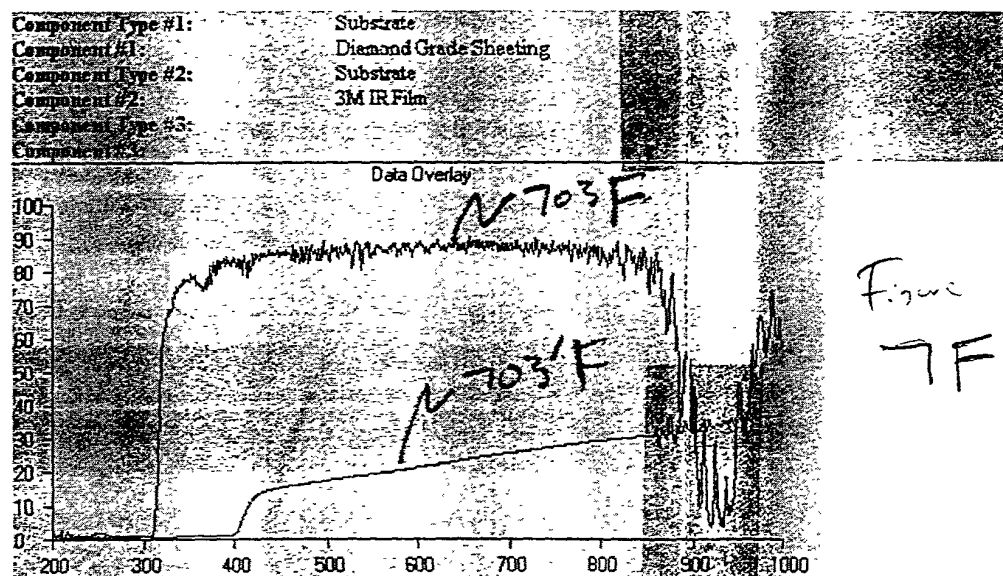
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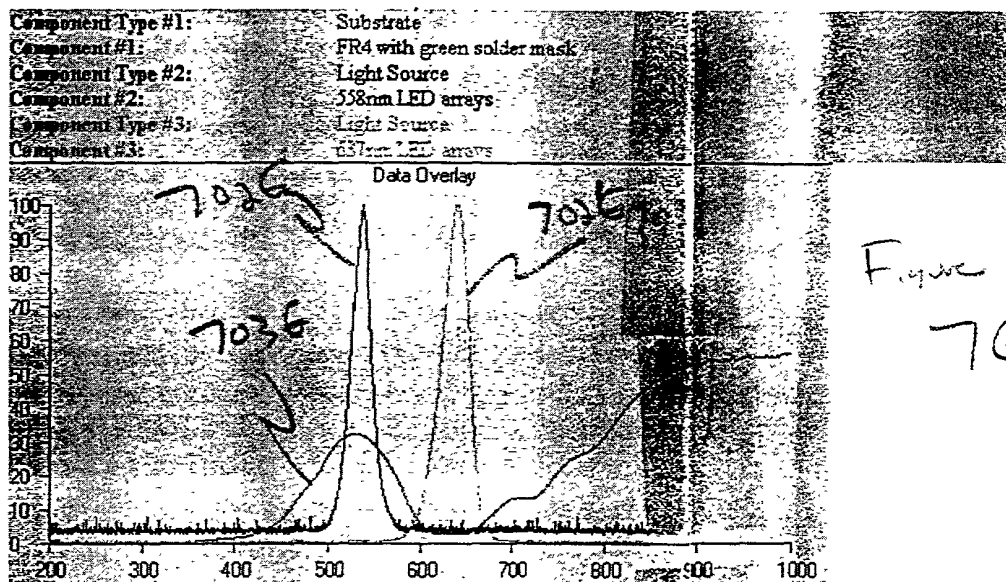
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TOPIC: Light Source Profile

Light Sources: Bluepoint

Emit. Wavelength: 300 - 600, 940 - 1150

Picture of Light Source:

Wavelength Region: C, D, E, F, G

Intensity:

Notes:



bluepoint light source.xls

Emit. Spectrum:

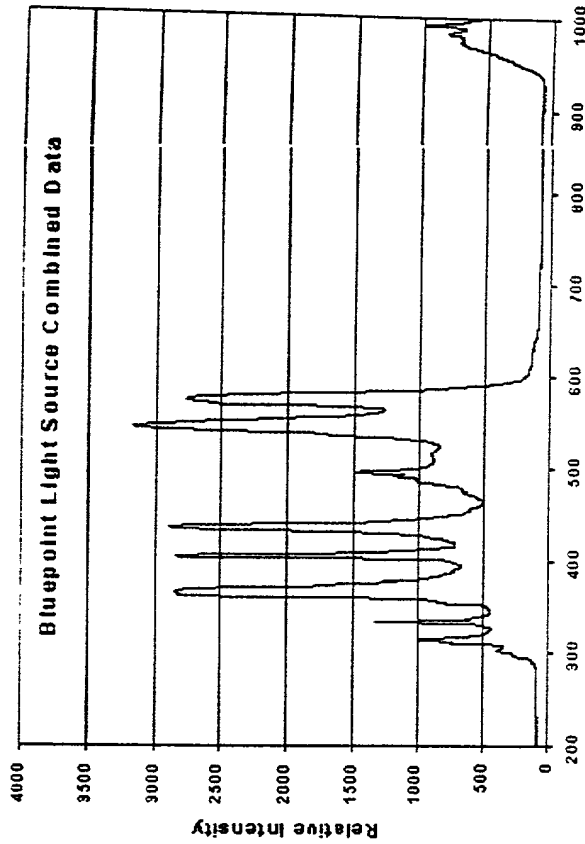


Figure - II

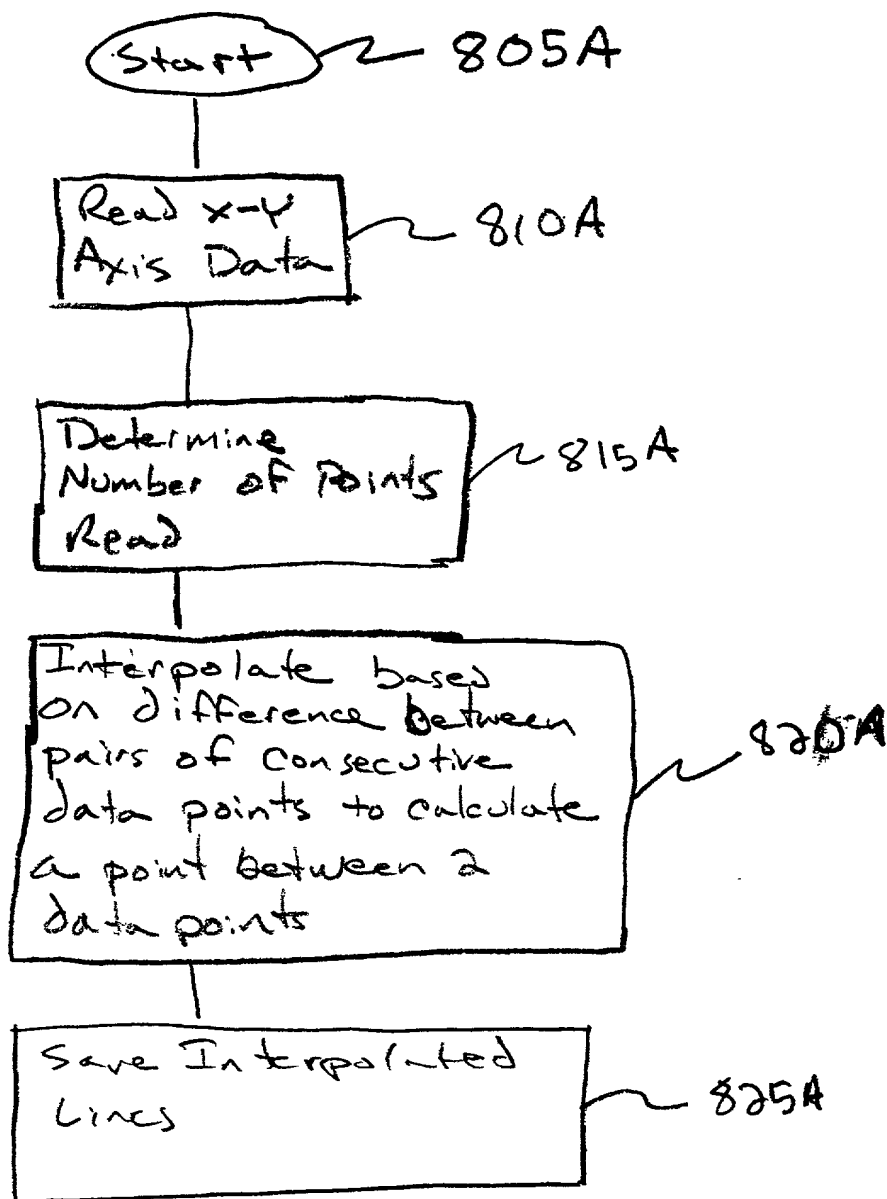


Figure 8A

Baseline

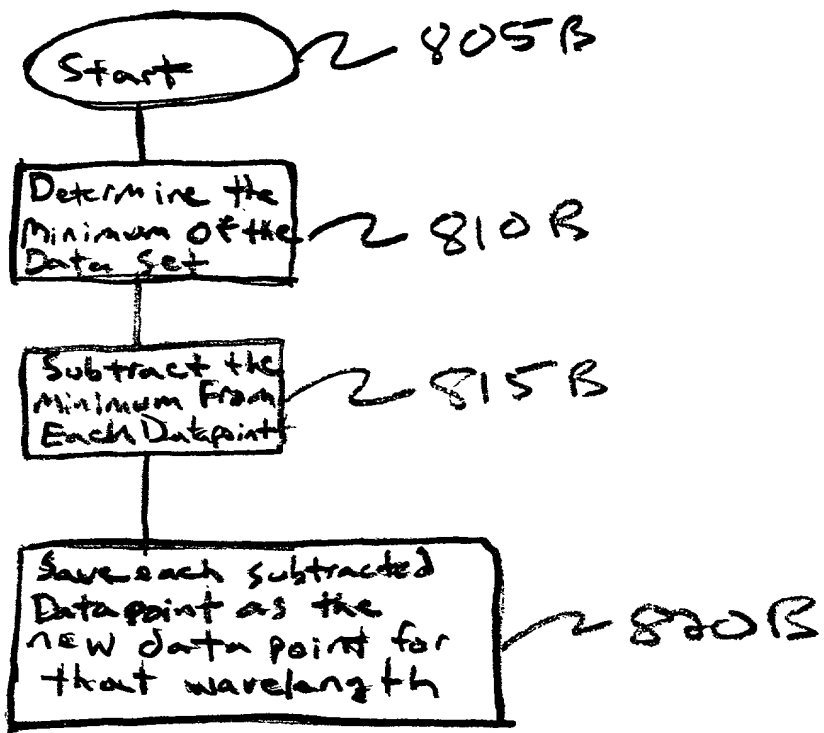


Figure 8 B

Norm

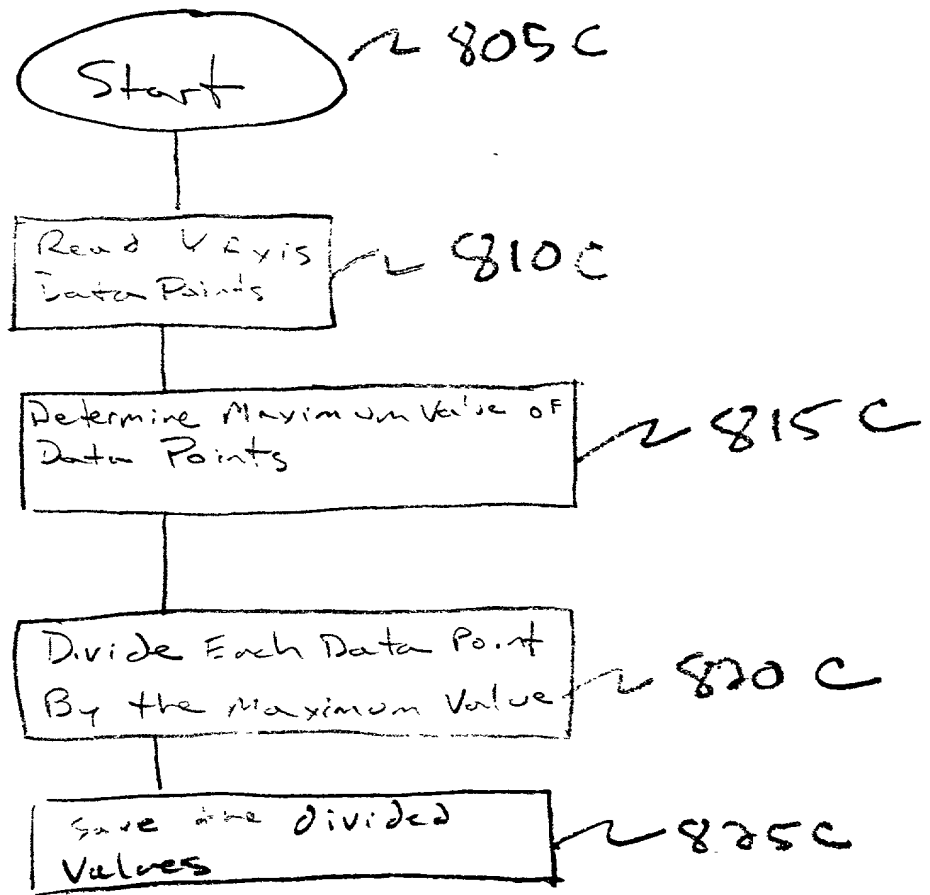


Figure 8C

10014390 102201

Integrate

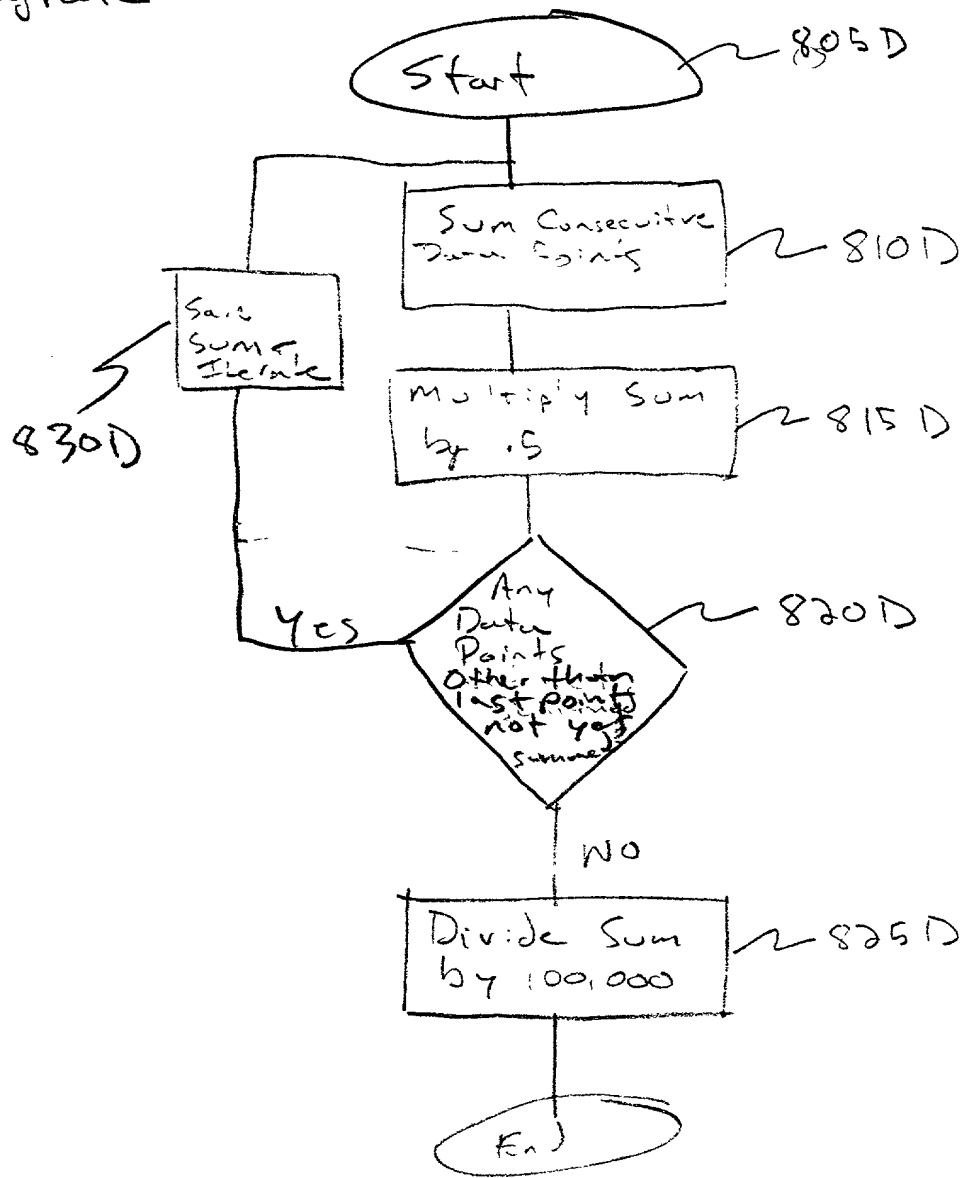


Figure 8D

10044390 1022201

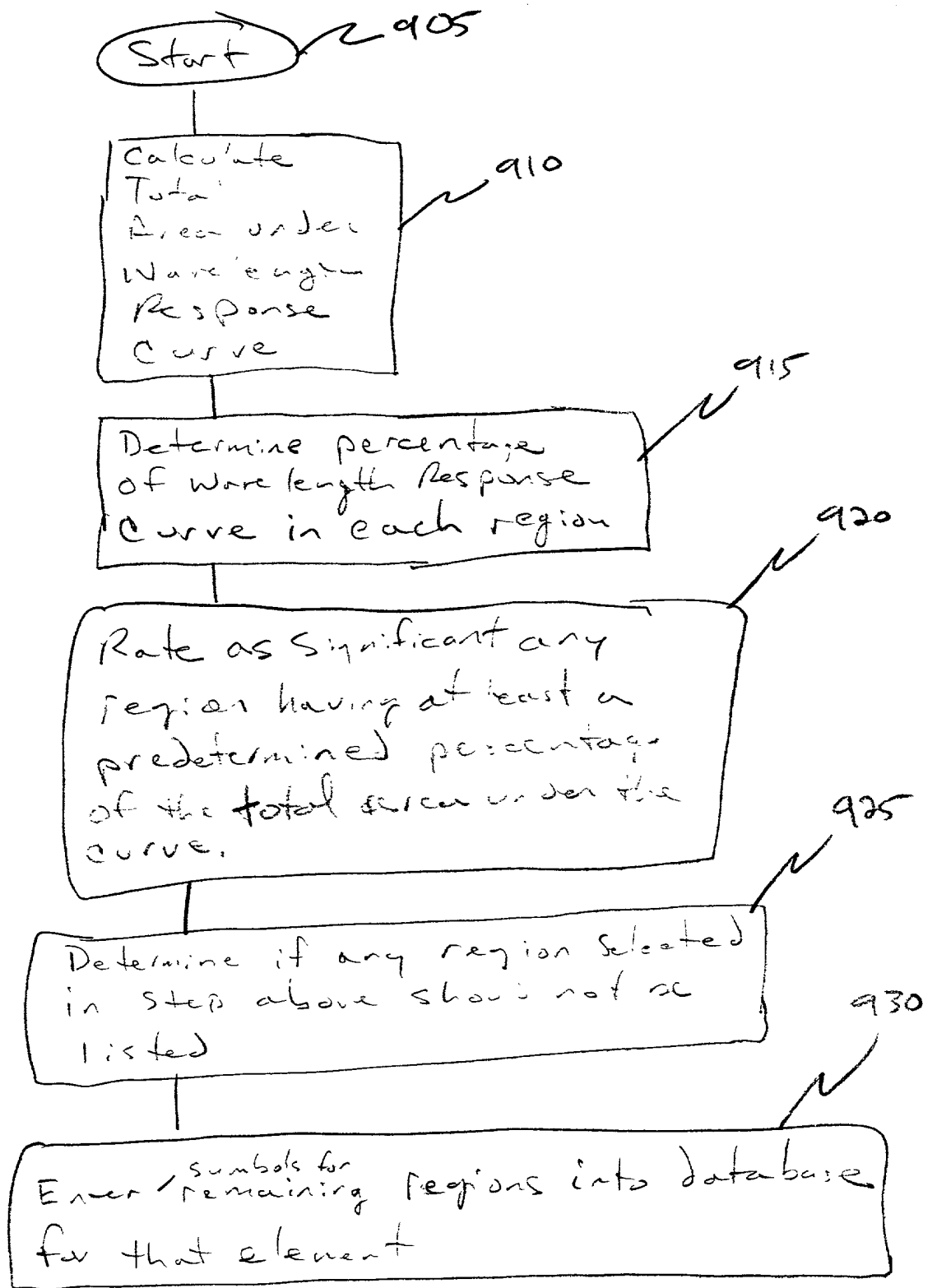


Figure 9

10044390, 102201

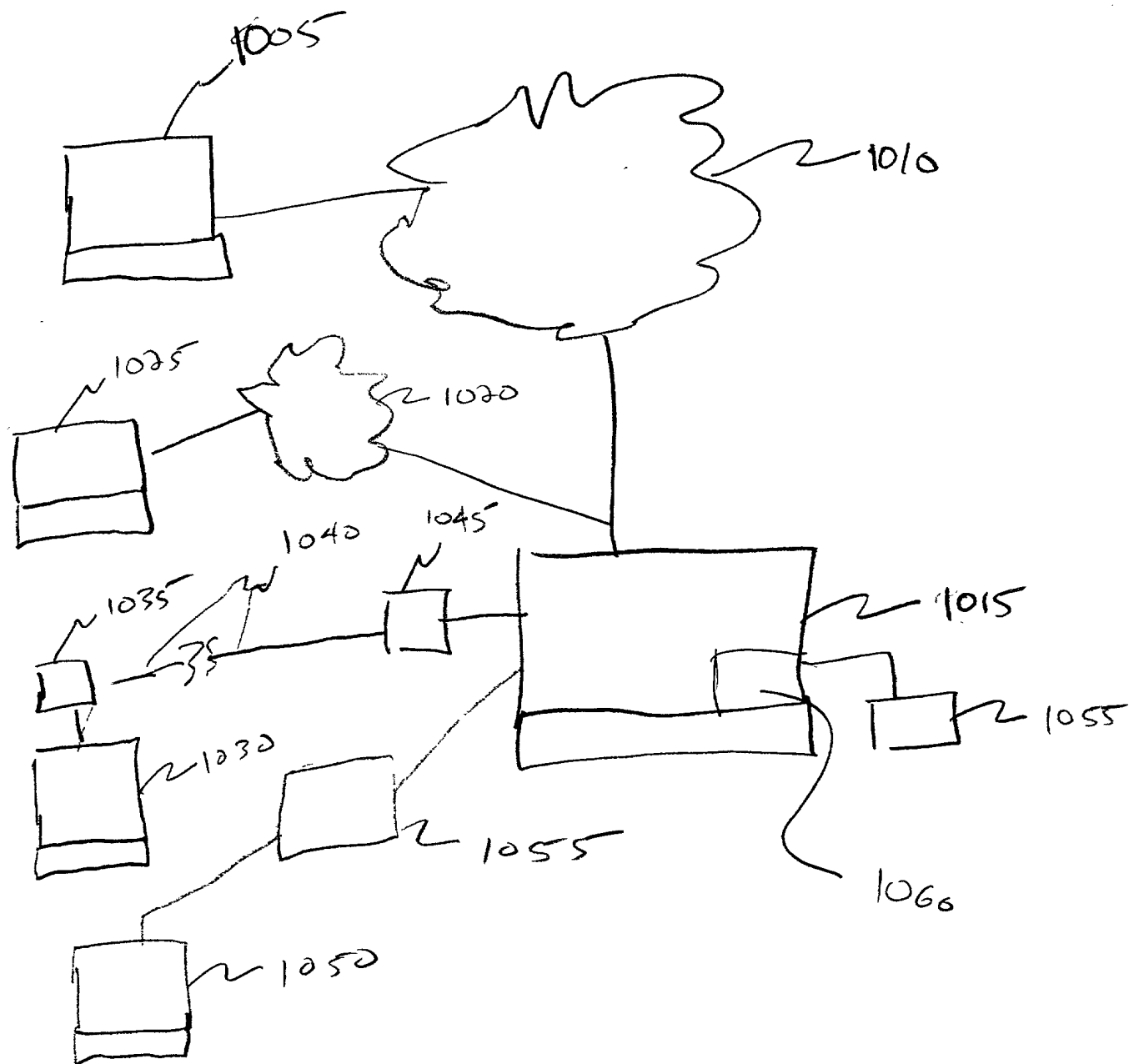


Figure 10

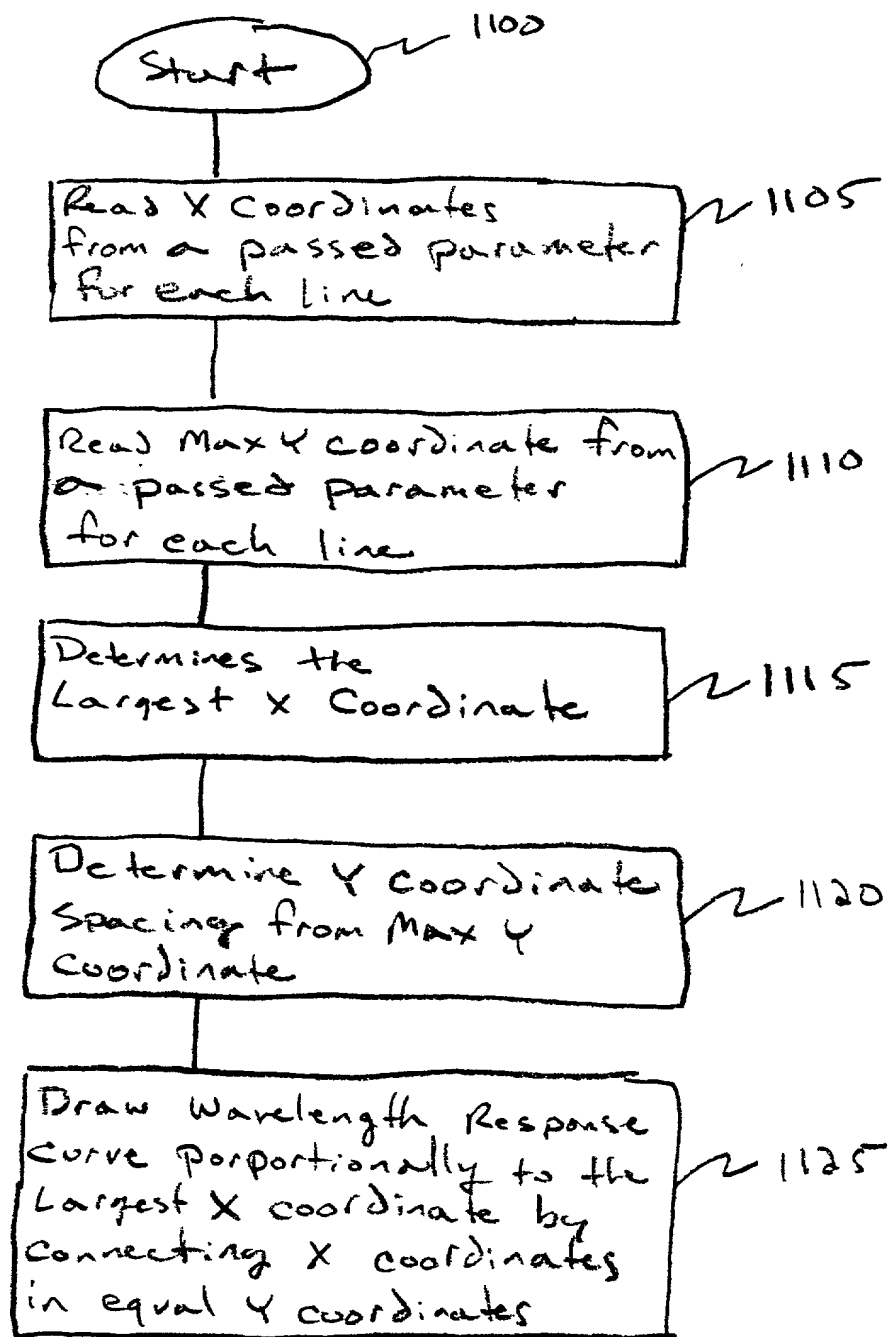


Figure 11.